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The Urban-Rural Divide: Surveillance and Protection of Communities¹

Submitted by Canada

Issue

1. In this age of increased worry about proliferation and terrorism, much thought has been put into protecting cities. States are more than just their cities, however, and it is of equal importance to ensure that rural areas receive the same measure of protection and surveillance. For many states, the rural population greatly exceeds that of the urban. When this is combined with a less dense rural health infrastructure due to the lower population density, a vulnerable and potentially alluring target presents itself. Additionally, access to specialized equipment and state of the art facilities may be difficult in a rural setting, and becomes problematic for a community that can be situated hundreds or thousands of kilometres from a major centre.

2. In Canada, which is a vast country with a diverse population in a wide range of ecological settings, the very factors which contribute to making Canada such a positive place in which to live can also create challenges in the provision of medical care, and in ensuring adequate surveillance and response capabilities in the case of natural or deliberate outbreaks of disease. The Canadian government has made the provision of high quality medical care to all Canadians a top priority. Public health, while separate from the actual provision of medical care, is also a top priority for Canada, and as a result the country has a mechanism in place for the surveillance of diseases that fall outside the normal pattern. This paper will examine some of the challenges that Canada faced in putting together its health surveillance system, as well as the solutions that it has found. In addition, Canada is also faced with issues raised by the movement of plant, animal or bacteriological species domestically. In most cases, this will be natural migration or spread, and the environment will have

¹/ Prepared by Foreign Affairs Canada/Health Canada/Canadian Food Inspection Agency

adjusted accordingly. In some instances, however, this movement may represent a distinct threat to a local ecosystem. Finally, this paper will highlight some of the tools that Canada uses to protect itself, which may be of interest to other large or geographically diverse states with similar considerations.

Challenges

3. Canada is the world's second largest country with a total area of 9 984 670 km². Distances in Canada can thus be vast, with St. John's, Newfoundland and Victoria, British Columbia being some 7314 km apart. Canada's population is relatively small when one considers its territory. At 32,207,113 persons (July 2003), Canada ranks only 35th in the world on this measure. Canada is also a very highly urbanized society, with the vast majority of the population living in or near the major metropolitan areas. However, there are also a large number of small communities that lie either between the cities or in the vast hinterland of Canada's north. These communities can be quite small and isolated. Iqaluit (population 5,236 in 2001) in the Nunavut Territory, for example, lies 2088 km from Ottawa; by comparison, London to Belgrade is 2073 km.

4. Adding to the challenge of access are the extreme winter weather conditions for which Canada is famous, as well as a lack of direct road or rail transport to some remote areas. Canadian health services must also be available in both official languages (English and French) and accessible in other languages (both first nations and international) depending upon circumstances.

5. When SARS hit Toronto in 2002-03, there was global and domestic concern about the containment of the disease if the situation had gotten out of hand in terms of both travellers headed by air to international destinations, and also those interested in travelling to other parts of Canada. Toronto is the largest city in Canada and has an extensive network of highly advanced medical facilities and laboratories. Given this infrastructure, Toronto was able to cope with the outbreak and successfully contain the virus (see Dr. Njoo's presentation on this subject). Were an outbreak of similar or greater virulence, be it naturally occurring or a deliberate use of BW, to occur outside a major centre, however, it is worth analysing the necessary variance in response patterns conditioned by the difference in circumstances in terms of both local treatment and steps to prevent its spread across the countryside and into urban areas. Conversely, were an incident to occur in a large urban centre that showed greater virulence than did the SARS outbreak, it can usefully be considered how such a city could be isolated to protect the surrounding country and other urban areas.

Reporting Structure (Human Health)

6. In Canada, medical care is ensured by universal coverage in a system that is administered by the provinces and territories and funded both at that level and by the federal government. The doctors and health workers in this system provide medical care to Canadians. The public health care system, which is responsible for disease surveillance, is similarly structured along provincial lines; below that level, there is a further breakdown of the population into Administrative Health Units, each of which has a medical officer who can coordinate efforts within the Unit, and can contact the provincial or territorial Chief Medical Officer in the event of a serious crisis. Within the Health Units are community medical practitioners, who can range from doctors in full-fledged hospitals to a

nurse practitioner in particularly isolated communities. All of these medical personnel are linked to their larger Health Unit, and this forms the first line of medical response and public health surveillance.

7. To ensure good surveillance and health care to all regions, Canada uses both a top-down and a bottom-up approach. In the “top-down” scenario, an outbreak of an unusual disease internationally would trigger the World Health Organization (WHO) to issue an alert to all states. For Canada, this alert would first be passed to Health Canada at the federal level. Health Canada would then disseminate this information to the chief medical officers of the provinces and territories, who in turn would pass it to medical officers in charge of the specific Administrative Health Units, from which it would reach the actual front-line health professionals. The information would be communicated by way of email, fax or bulletin board notices as appropriate. Along with the basic alert would be a relatively detailed description of the disease, its symptoms, mode of transmission, recommended treatments and quarantine procedures (if applicable). Health practitioners would be requested to report any incidents of the disease to their local Medical Health Officer if cases were to emerge among their patients.

8. The “bottom-up” approach uses the same network, but this time as a way of informing the outside world of incidents that occur in a given community. In this case, a medical professional, coming across an unusual disease or a patient with atypical symptomology, will contact the local medical officer in charge, who could choose to pass it along to the provincial chief medical officer, from where news could eventually reach Health Canada, should the situation merit. The communication of this information from the provincial to federal level is not legally mandated in Canada, but is regarded as standard practice. Depending upon the situation, Health Canada could then inform the other provinces and territories to be alert to this new disease or set of symptoms, as well as informing the WHO, should the situation be considered particularly serious.

9. A useful tool for health workers in this endeavour is the list of nationally notifiable diseases. This list is agreed by consensus among provincial and federal health authorities. The current list of notifiable diseases can be found in Annex I. Any health worker encountering a patient with one of the diseases on this list is legally obligated immediately to inform the relevant authorities in the chain described above.

10. The situation is different for new diseases, as they are not contained on the notifiable diseases list but may still present a significant health risk. Standard practice in Canada is that, in the event of a patient entering a clinic or hospital with serious atypical symptoms, the same information-transmission procedure outlined above is undertaken. Obviously, however, this is contingent upon well-informed health professionals and public health authorities, which reinforces the need for up-to-date training in the medical sciences and public health, a good communication system that allows for queries to be passed up and down the line, and a capacity for sufficiently rapid analysis so that a minor ailment does not trigger a nationwide alert.

Response and Mitigation:

11. Once the disease has been identified and relevant authorities notified, it is necessary to deal with the outbreak. For an isolated incident, a single patient or a handful of individuals, the local hospital or clinic may be able to provide sufficient care as well as quarantine facilities if these are deemed necessary. In the case of a larger outbreak, a rural area may quickly find that its facilities are overwhelmed and that additional support is required. Once again, public health and medical care infrastructures can be utilized to request assistance, first from the immediate geographic area, then from the province or territory as a whole, and finally from other parts of Canada or even internationally, should the situation merit such action.

12. At the extremes, such a response would not be unique to a rural area, as even an urban centre suffering from a mass outbreak could find that its immediate health infrastructure was unable to cope with potentially hundreds or thousands of seriously ill and infectious patients. An obvious difference can however be seen between urban and rural communities, based upon the relative size and complexity of their health infrastructures. In a major urban centre, there will be numerous hospitals with specialists and specialized equipment, which can be accessed in a relatively short period of time and at a relative minimum of expense and inconvenience to address the problem at hand. Additionally, should the facilities or resources of the urban centre come under obvious strain, it is again relatively easy to bring additional resources or personnel to the scene. On the other hand, a rural area or isolated community will have a much lower level of on-site specialized expertise and equipment. In the event of isolated cases requiring specialized care beyond the capabilities of local health personnel, provisions exist to airlift patients to the nearest facility that can provide these services. If an area sees a major outbreak, federal-provincial contingency planning and physical arrangements are in place for personnel and equipment to be brought to the region to deal with the situation.

13. Ironically, despite their distance from major centres and their medical infrastructure, rural areas in Canada have certain advantages over the big cities. In the first place, a smaller and often more closely knit population may be better able to track sickness among neighbours. An urban populace, whose neighbours are often strangers, can be harder pressed to accomplish this same goal. Additionally, doctors in small communities, having fewer specialists in the immediate area to call upon, are often less prone to refer patients, resulting in fewer transfers and thus cutting down on the number of medical facilities that may be inadvertently infected. As well, the lack of referral may mean a quicker decision erring on the side of caution, thus helping to stem the tide of infection. Finally, in the case of a particularly infectious or virulent outbreak, where a quarantine may be deemed necessary, it is often easier to isolate a smaller community than a city of several millions.

Ensuring Proper Surveillance

14. A country as diverse as Canada must ensure that health professionals understand the communities with which they are dealing, and that they incorporate a necessary regard for cultural sensitivities into the structures of an effective health-care/health-surveillance system. This often requires mutual education on the part of practitioners and the community. It also gives prominence to the ability to provide service in the language of the community.

15. In some cases, particularly for remote areas, this can be expedited by encouraging the community to send local students to medical schools. Such practitioners, if they choose to return and establish a practice, are intimately familiar with the needs and idiosyncrasies of their patients. Such an approach is also likely to enhance comprehensive surveillance and response by ensuring that the national medical infrastructure has a local interface, possibly made up of local residents. Cooperation among governments, practitioners and communities in medical and public health matters is something that must be mutually beneficial and reinforced over time.

16. The overall health of a community can have a direct bearing on both its susceptibility to disease outbreaks as well as its ability to maintain accurate surveillance of health conditions as a whole. The issues involved go far beyond a basic health infrastructure, and touch on broader socio-economic policies. It is also a key component of disease surveillance and response systems.

Animal Health

17. In terms of reporting, animal health in Canada is handled in a fashion similar to human health. Local veterinarians are the front line of defence in the case of disease outbreaks, and are responsible for reporting unusual outbreaks to the central authorities. Unlike the case of human health, there is no provincial jurisdiction for animal outbreaks. In the event of a disease occurrence, local veterinarians are obliged to contact the Canadian Food Inspection Agency (CFIA) which then evaluates and disseminates the information as necessary. The Canadian Health of Animals Act mandates that veterinarians report all occurrences of notifiable diseases in their charges (see Annex II for this list). In the case of a previously unknown disease, while there is no legal obligation to report, it is considered a standard practice. The CFIA can also disseminate information downward to local area veterinarians in the event of international outbreaks, through the Canadian Veterinary Medical Association (CVMA).

18. In the event of a suspected outbreak, the infected animal will be destroyed and tissue samples sent to a CFIA lab. CFIA will then make the decision as to whether a larger cull is required to contain the disease. If such a cull is called for, CFIA will send officials and equipment to the field as needed. The Health of Animals Act has a procedure for providing compensation to animal owners following a cull. Vaccination of herds is generally not a preferred option; while this tactic might stem the tide of the disease, the animals vaccinated become unsuitable for market. CFIA's reach is comprehensive throughout all parts of the country, and the animals it tracks range from common barnyard stock such as cows and chickens, to less domesticated species such as reindeer.

Plant Health

19. The situation with plants is somewhat more complex than the case with animals, given the greater number of species and associated diseases involved. Cultivators are under no obligation to report outbreaks to the CFIA or other bodies, but many choose to do so. CFIA is also able to keep track of plant diseases through the use of survey programmes. In the case of an outbreak, a determination has to be made as to the virulence of the pathogen as well as the probability of eliminating the disease. Based upon this calculation, CFIA may act to create "firewalls" around infected regions, similar to the culling of livestock, in order to contain the disease.

20. Emergency regulations can be put in place by CFIA under the Health of Animals Act, prohibiting the movement of infected or potentially infected specimens out of a disease region. Violation of these regulations can result in severe penalties, such as fines and/or prison terms. Under non-emergency conditions, however, no control is imposed upon the movement of plants or livestock from one region of the country to another, or on the attendant possibility of species from one ecosystem being transferred accidentally or deliberately to another.

Conclusion

21. In an age where both natural disease outbreaks and bio-terrorism are high priority concerns, where new diseases keep cropping up and old ones re-emerge, a good health care infrastructure and public health system are not just a privilege or even a right, it is a necessity. While big cities have the greatest population densities and present the most concentrated locus for both natural and deliberate outbreaks of disease, the rural areas represent a fundamental part of the nation and economy that cannot be ignored, and moreover one with its own strengths and vulnerabilities from a medical and public health viewpoint. The system that Canada has developed to respond to both urban and rural challenges offers one model of how to maintain a surveillance and mitigation capability across a huge and diverse country. An exchange of ideas among state parties, particularly those with different environmental conditions and population distributions, might prove useful in advancing analysis of such considerations, with the goal of ensuring complete coverage of a state, in both in the urban and rural areas, and covering human, animal and plant populations. Through such action, both the chance of new global pandemics and the threat posed by biological weaponry could be significantly reduced.

Annex I**Current List of Nationally Notifiable Diseases (Human)***(last updated Sept 19, 2003)*

Acquired Immunodeficiency Syndrome (AIDS)
Acute Flaccid Paralysis (AFP)
Anthrax
Botulism
Brucellosis
Campylobacteriosis
Chickenpox
Chlamydia Infection
Cholera
Congenital Rubella Syndrome (CRS)
Creutzfeld-Jakob Disease (CJD)
Cryptosporidiosis
Cyclosporiasis
Diphtheria
Giardiasis
Gonorrhea
Group B Streptococcal Disease of the Newborn
Hantavirus Pulmonary Syndrome (HPS)
Hepatitis A
Hepatitis B
Hepatitis C
Human Immunodeficiency Virus (HIV)
Influenza, laboratory-confirmed
Invasive *Haemophilus influenzae* type b (Hib) Disease
Invasive Group A Streptococcal Disease
Invasive Meningococcal Disease
Invasive Pneumococcal Disease
Legionellosis
Leprosy (Hansen's Disease)
Malaria
Measles
Mumps
Pertussis
Plague
Poliomyelitis
Rabies
Rubella
Salmonellosis
Shigellosis
Smallpox

Syphilis, Congenital

Syphilis, Infectious (Primary, Secondary and Early Latent) Syphilis, Other (Late Latent, Neurosyphilis, Tertiary other than Neurosyphilis)

Tetanus

Tuberculosis

Tularemia

Typhoid

Verotoxigenic *Escherichia coli* Infection

Viral Hemorrhagic Fevers

West Nile virus Infection (WNV Asymptomatic Infection, WNV Neurological Syndrome, WNV Fever)

Yellow Fever

Source: Health Canada: Centre for Infectious Disease Prevention and Control
http://www.hc-sc.gc.ca/pphb-dgsp/bid-bmi/dsd-dsm/duns_e.html

Annex II**Current List of Nationally Notifiable Diseases (Animal)**

SCHEDULE VII

IMMEDIATELY NOTIFIABLE DISEASES

Item	Disease
1.	aino virus infection
2.	akabane disease
3.	avian chlamydiosis (<i>C. psittaci</i>)
4.	avian encephalomyelitis
5.	avian infectious laryngotracheitis
6.	besnoitiosis
7.	Borna disease
8.	bovine babesiosis (<i>B. bovis</i>)
9.	bovine ephemeral fever
10.	bovine petechial fever
11.	contagious agalactia
12.	contagious caprine pleuropneumonia
13.	dourine
14.	duck hepatitis
15.	egg drop syndrome (adenovirus)
16.	enterovirus encephalomyelitis (Teschén disease)
17.	epizootic haemorrhagic disease
18.	epizootic lymphangitis
19.	equine encephalomyelitis, western and eastern
20.	fluvalinate-resistant Varroa mite
21.	fowl cholera
22.	glanders
23.	goose parvovirus infection (Derzsy's disease)
24.	heartwater (cowdriosis)
25.	hendra virus
26.	herpes virus of cervidae
27.	Ibaraki disease
28.	Japanese encephalitis
29.	louping ill
30.	Nairobi sheep disease
31.	Nipah virus
32.	screwworm (<i>Cochliomyia hominivorax</i> and <i>Chrysomya bezziana</i>)
33.	small hive beetle (<i>Aethina tumida</i>)
34.	theileriasis
35.	tick-borne fever (<i>Cytoecetes phagocytophilia</i>)
36.	tissue worm (<i>Elaphostrongylus cervi</i>)
37.	trypanosomiasis (exotic to Canada)
38.	turkey viral rhinotracheitis or swollen head disease in chickens

- 39. viral haemorrhagic disease of rabbits
- 40. Wesselbron's disease
- 41. West Nile fever

ANNUALLY NOTIFIABLE DISEASES

Item	Disease
1.	acarine disease
2.	actinomycosis
3.	American foul brood
4.	atrophic rhinitis
5.	avian infectious bronchitis
6.	avian leukosis
7.	avian salmonellosis
8.	avian spirochaetosis
9.	avian tuberculosis
10.	blackleg
11.	botulism
12.	bovine genital campylobacteriosis
13.	bovine malignant catarrhal fever
14.	bovine viral diarrhoea or mucosal disease
15.	caprine arthritis-encephalitis
16.	caseous lymphadenitis
17.	coccidiosis
18.	contagious ophthalmia
19.	contagious pustular dermatitis
20.	dermatophilosis
21.	distomatosis (liver fluke)
22.	duck virus enteritis
23.	echinococcosis or hydatidosis
24.	enterotoxaemia
25.	enzootic abortion
26.	enzootic bovine leucosis
27.	equine coital exanthema
28.	equine influenza
29.	equine rhinopneumonitis
30.	European foul brood
31.	filariasis
32.	foot-rot
33.	fowl pox
34.	haemorrhagic septicemia
35.	horse mange (<i>Psoroptes equi</i>)
36.	equine viral arteritis
37.	infectious bovine rhinotracheitis (IBR or IPV)
38.	infectious bursal disease (Gumboro disease)

39. infectious coryza
40. intestinal salmonella infections
41. listeriosis
42. maedi-visna
43. Marek's disease
44. melioidosis
45. avian mycoplasmosis (*M. Gallisepticum*)
46. myxomatosis
47. nosematosis of bees
48. other clostridial infections
49. other pasteurelloses
50. ovine epididymitis (*Brucella ovis*)
51. ovine pulmonary adenomatosis
52. paratuberculosis (Johne's disease)
53. porcine reproductive and respiratory syndrome (PRRS)
54. Q fever
55. *Salmonella abortus ovis*
56. *Salmonella abortus equi*
57. sheep mange (scab)
58. strangles
59. swine erysipelas
60. toxoplasmosis
61. transmissible gastroenteritis (TGE)
62. trichomoniasis
63. tularaemia
64. ulcerative lymphangitis
65. vibronic dysentery
66. warble infestation

Source: Department of Justice, Health of Animals Act:

<http://laws.justice.gc.ca/en/H-3.3/C.R.C.-c.296/135271.html#rid-13547>
